CLAIMS

1. A Mach-Zehnder interferometer modulator for modulating a beam of laser light, the modulator including a pair of separate waveguides through which the laser light is passed after splitting in a splitting zone and after which the light is recombined in a merge zone, the waveguides being formed of a material having electro-optic properties and there being provided opposed pairs of electrodes electrically located so as to be able to effect optical changes within the material of the waveguides, characterised in that the waveguides are formed in a semiconductor material with one of the electrodes of each pair being formed in a doped layer, said doped layer being of relatively high conductivity compared to the semiconductor material, buried within or below the waveguide material whilst the other electrode, the top electrode, is a surface metalisation, the doped layer being trenched so that adjacent electrodes in the doped layer are electrically isolated from one another so that one of the electrodes in the doped layer can be connected with a different electrical polarity to the other electrode in the doped layer thereby permitting the connection of the pairs of electrodes in parallel anti-phase mode.

2. A modulator as claimed in claim 1 further characterised in that there is a coplanar stripline transmission-line for an RF signal comprising a pair of metal rails arranged on either side of the Mach-Zehnder Interferometer waveguide-pair, each rail effecting direct contact to the buried electrode of the adjacent waveguide while also effecting contact to the top electrode of the remote waveguide by means of metal linkages passing through or over the adjacent waveguide.

3. A modulator as claimed in claim 1 further characterised in that there is a coplanar waveguide transmission-line for an RF signal

comprising three rails, a central rail at one potential and located between the waveguides, and two outer rails at the same, second, potential which differs from the first potential, with each waveguide of the Mach-Zehnder Interferometer waveguide-pair running in one of the two inter-rail gaps, the central rail effecting direct contact to the buried electrode of the first waveguide and contacting the top electrode of the second waveguide by means of metal linkages, the top electrode of the first waveguide being contacted by means of metal linkages from the first outer rail, and the second outer rail being in direct contact to the buried electrode of the second waveguide.

4. A modulator as claimed in claim 3 in which the doped layer extends beneath the first outer rail, and there is provided a trench through the doped layer so as to isolate the region of the doped layer beneath the first waveguide from that beneath the first outer rail.

5. A modulator as claimed in claim 1 further characterised in that there is a coplanar stripline transmission-line for an RF signal comprising a pair of metal rails arranged on either side of the Mach-Zehnder Interferometer waveguide-pair, each rail having a width sufficient to enable capacitive connection to the buried electrode over which it is located and effecting thereby high frequency contact to the buried electrode of the adjacent waveguide while also effecting contact to the top electrode of the remote waveguide by means of metal linkages passing through or over the adjacent waveguide.

6. A modulator as claimed in claim 1 further characterised in that there is a coplanar waveguide transmission-line for an RF signal comprising three rails, a central rail at one potential and located between the waveguides, and two outer rails at the same, second, potential, with each waveguide of the Mach-Zehnder Interferometer waveguide-pair running in one of the two inter-rail gaps, the central

rail and one of the outer rails being of sufficient width to enable those rails to make capacitance contact with their opposed buried electrodes, the central rail effecting capacitive contact to the buried electrode of the first waveguide and contacting the top electrode of the second waveguide by means of metal linkages, the top electrode of the first waveguide being contacted by means of metal linkages from first outer rail, and the second outer rail being in capacitive contact to the buried electrode of the second waveguide, the capacitive contacts being effective electrical contacts for high frequency alternating signals.

7. A modulator as claimed in claim 6 in which the doped layer extends beneath the first outer rail, and there is provided a trench through the doped layer so as to isolate the region of the doped layer beneath the first waveguide from that beneath the first outer rail.

8. A modulator as claimed in any one of the preceding claims in which there is provided a passive waveguide region trenched as in the active regions between the active regions and the merge zone

9. A modulator as claimed in any one of the preceding claims in which there is provided a passive waveguide region trenched as in the active regions between the active regions and the splitter zone

10. A modulator as claimed in any one of the preceding claims in which conductivity in the doped area is locally removed in the region of the merge zone.

11. A modulator as claimed in any one of the preceding claims in which conductivity in the doped area is locally removed in the region of the splitter zone.

12. A modulator as claimed in any one of the preceding claims in which the semiconductor material is based on GaAs, and the waveguides are formed in GaAs bounded by layers of AlGaAs.

13. A modulator as claimed in any one of claims 1 to 12 in which the semiconductor material is selected from the group InGaAsP, or GaInAsP or GaAlInP and the bounding layer is InP.

14. A modulator as claimed in any one of the preceding claims in which the electrode formed by surface metalisation is a Schottky rectifying contact.

15. A modulator as claimed in any one of claims 1 to 13 in which the electrode formed by surface metalisation is an ohmic contact to a p-doped under layer.

16. A Mach-Zehnder interferometer modulator for modulating a beam of laser light substantially as herein described with reference to Figures 6 and 7, or Figures 8 and 9, or Figure 10a or Figure 10b of the accompanying drawings.